WHAT IS CLAIMED IS:

1. An optical multiplexing circuit to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, comprising:

a plurality of input transmission channel waveguides to each of which a corresponding one of a plurality of optical signals is input;

plural pairs of input monitoring channel waveguides into which a beam is introduced in a direction opposite to that for the input transmission channel waveguides and which output demultiplexed beams, each of the pairs including a first input monitoring channel waveguide and a second input monitoring channel waveguide;

an input slab waveguide having a first facet, wherein the first facet connected to said plurality of input transmission channel waveguides and said plural pairs of input monitoring channel waveguides;

at least one output transmission channel waveguide to which the multiplexed beam is guided, the multiplexed beam being obtained by multiplexing said plurality of optical signals transmitted from said plurality of input transmission channel waveguides;

at least one output monitoring channel waveguide into which a beam is introduced in a direction opposite to that for the output transmission channel waveguides and which

transmits said demultiplexed beams to said plural pairs of input monitoring channel waveguides;

an output slab waveguide having a fourth facet, wherein the fourth facet connected to said at least one output transmission channel waveguide and said at least one output monitoring channel waveguides; and

an arrayed waveguide comprising a plurality of optical waveguides having different optical path lengths, wherein the arrayed waveguide is connected to a second facet which is located opposite said first facet of said input slab waveguide, and is connected to a third facet which is located opposite said fourth facet of said output slab waveguide,

wherein when said multiplexed beam is introduced into said fourth facet of said output slab waveguide through said output monitoring channel waveguide, the multiplexed light passes through the output slab waveguide and is demultiplexed by said input slab waveguide, and the demultiplexed beams are guided to the first facet and are output to said each pair of input monitoring channel waveguides having a corresponding wavelength.

2. The optical multiplexing circuit as claimed in claim 1,

wherein at said first facet of said input slab waveguide,

said plurality of input transmission channel waveguides are arranged at predetermined intervals,

said each pair of input monitoring channel waveguides constituting said plural pairs of input monitoring channel waveguides is arranged so that center position of said each pair is spaced at predetermined interval, and

the predetermined intervals at which the plurality of input transmission channel waveguides are arranged have a predetermined correlationship with the predetermined intervals at which the center positions of said plural pairs of input monitoring channel waveguides are arranged, and

at said fourth facet of said output slab waveguide,

said output transmission channel waveguide is located relative to said plurality of input transmission channel waveguides arranged at said first facet of said input slab waveguide, and said output transmission channel waveguide is located at such a position that the output transmission channel waveguide can multiplex said plurality of optical signals transmitted from the plurality of input transmission channel waveguides to generate said multiplexed beam, and

said output monitoring channel waveguide is located relative to said each pair of input monitoring channel waveguides arranged at said first facet of said input slab waveguide, and said output monitoring channel waveguide is located at such a position that said demultiplexed beams

guided to said each pair of input monitoring channel waveguides can be produced.

3. An optical multiplexing circuit to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, comprising:

a plurality of input transmission channel waveguides to each of which a corresponding one of a plurality of optical signals is input;

at least one input monitoring channel waveguide into which a beam is introduced in the same direction as that for the input transmission channel waveguides and to which a multiplexed beam is input;

an input slab waveguide having a first facet, wherein the first facet connected to said plurality of input transmission channel waveguides and said at least one input monitoring channel waveguide;

at least one output transmission channel waveguide to which the multiplexed beam is guided, the multiplexed beam being obtained by multiplexing said plurality of optical signals transmitted from said plurality of input transmission channel waveguides;

plural pairs of output monitoring channel waveguides into which a beam is introduced in the same direction as that for the output transmission channel waveguides and to which said demultiplexed beams transmitted from said

input monitoring channel waveguide are input, each of the pairs comprising a first output monitoring channel waveguide and a second output monitoring channel waveguide;

an output slab waveguide having a fourth facet, wherein the fourth facet connected to said at least one output transmission channel waveguide and said plural pairs of output monitoring channel waveguides; and

an arrayed waveguide comprising a plurality of optical waveguides having different optical path lengths, wherein the arrayed waveguide is connected to a second facet which is located opposite said first facet of said input slab waveguide, and is connected to a third facet which is located opposite said fourth facet of said output slab waveguide,

wherein when said multiplexed beam is introduced into said first facet of said input slab waveguide through said input monitoring channel waveguide, the multiplexed light passes through the input slab waveguide and is demultiplexed by said output slab waveguide, and the demultiplexed beams are guided to the fourth facet and are output to said each pair of output monitoring channel waveguides having corresponding wavelengths.

4. The optical multiplexing circuit as claimed in claim 3,

wherein at said first facet of said input slab waveguide,

said plurality of input transmission channel waveguides are arranged at predetermined intervals,

said input monitoring channel waveguide is located relative to said each pair of output monitoring channel waveguides arranged at said fourth facet of said output slab waveguide, and said input monitoring channel waveguide is located at such a position that said demultiplexed beams guided to said each pair of output monitoring channel waveguides can be produced, and

at said fourth facet of said output slab waveguide,

said each pair of output monitoring channel waveguides constituting said plural pairs of output monitoring channel waveguides is arranged so that center position of said each pair of output monitoring channel waveguides is spaced at predetermined interval,

the predetermined intervals at which the plurality of input transmission channel waveguides are arranged have a predetermined correlationship with the predetermined intervals at which the center positions of said plural pairs of output monitoring channel waveguides are arranged, and

said output transmission channel waveguide is located relative to said plurality of input transmission channel waveguides arranged at said first facet of said input slab waveguide, and said output transmission channel waveguide

is located at such a position that the output transmission channel waveguide can multiplex said plurality of optical signals transmitted from the plurality of input transmission channel waveguides to produce said multiplexed beam.

5. An optical multiplexing circuit to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, comprising:

a plurality of input transmission channel waveguides to each of which a corresponding one of a plurality of optical signals is input;

plural pairs of input monitoring channel waveguides into which a beam is introduced in a direction opposite to that for the input transmission channel waveguides and which output demultiplexed beams, each of the pairs including a first input monitoring channel waveguide and a second input monitoring channel waveguide;

an input slab waveguide having a first facet, wherein the first facet connected to said plurality of input transmission channel waveguides and said plural pairs of input monitoring channel waveguides;

a pair of a first output transmission channel waveguide and a second output transmission channel waveguide to which the multiplexed beam is guided, the multiplexed beam being obtained by multiplexing said

plurality of optical signals transmitted from said plurality of input transmission channel waveguides;

a pair of a first output monitoring channel waveguide and a second output monitoring channel waveguide into which a beam is introduced in a direction opposite to that for said pair of output transmission channel waveguides and which transmits said demultiplexed beams to said plural pairs of input monitoring channel waveguides;

an output slab waveguide having a fourth facet, wherein said fourth facet connected to said pair of the first and second output transmission channel waveguide and said pair of the first and second output monitoring channel waveguides; and

an arrayed waveguide comprising a plurality of optical waveguides having different optical path lengths, wherein the arrayed waveguide is connected to a second facet which is located opposite said first facet of said input slab waveguide, and is connected to a third facet which is located opposite said fourth facet of said output slab waveguide,

wherein when beams obtained by dividing said multiplexed beam are introduced into said fourth facet of said output slab waveguide through said pair of output monitoring channel waveguides, the beams passes through the output slab waveguide and is demultiplexed by said input slab waveguide, and the demultiplexed beams are guided to the first facet and are output to said each pair

of input monitoring channel waveguides having a corresponding wavelength.

6. The optical multiplexing circuit as claimed in claim 5,

wherein at said first facet of said input slab waveguide,

said plurality of input transmission channel waveguides are arranged at predetermined intervals,

said each pair of input monitoring channel waveguides constituting said plural pairs of input monitoring channel waveguides is arranged so that one of the channel waveguides of each pair as a reference position is arranged at predetermined intervals, and

the predetermined intervals at which the plurality of input transmission channel waveguides are arranged have a predetermined correlationship with the predetermined intervals at which the one of said plural pairs of input monitoring channel waveguides is arranged by using one of the channel waveguides of one pair as a reference position,

at said fourth facet of said output slab waveguide,

said pair of output transmission channel waveguides are located relative to said plurality of input transmission channel waveguides arranged at said first facet of said input slab waveguide, and said pair of output transmission channel waveguides are located at such positions that the output transmission channel waveguides

can multiplex said plurality of optical signals transmitted from the plurality of input transmission channel waveguides to produce said multiplexed beam, and

said pair of output monitoring channel waveguides are located relative to said each pair of input monitoring channel waveguides arranged at said first facet of said input slab waveguide, and said each pair of output monitoring channel waveguides is located at such positions that said demultiplexed beams guided to said each pair of input monitoring channel waveguides can be produced.

7. An optical multiplexer to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, comprising:

an optimal multiplexing circuit set forth in claim 1;

extracting means for extracting a part of the multiplexed beam output from said optical multiplexing circuit to obtain a check signal;

check signal reintroducing means for reintroducing said extracted check signal into said optical multiplexing circuit; and

check signal detecting means for detecting said check signal reintroduced into said multiplexing area, at a facet located opposite the facet into which the signal has been reintroduced.

8. The optical multiplexer as claimed in claim 7,

wherein said extracting means comprises a branching section that branches a part of said multiplexed beam output from an output facet of said optical multiplexing circuit to obtain said check signal,

said check signal reintroducing means comprises a first check terminal section connected to said branching section and installed at the output facet of said optical multiplexing circuit, and

said check signal detecting means comprises plural pairs of second check terminal sections installed at an input facet of said optical multiplexing circuit, and

wherein said multiplexed beam output from the output facet of said optical multiplexing circuit is branched by said branching section to extract said check signal, and

said extracted check signal is reintroduced into said optical multiplexing circuit through said first check terminal section and then is output from said each of plural pairs of second check terminal sections as a check signal.

9. The optical multiplexer as claimed in claim 7,

wherein said extracting means comprises a branching section that branches a part of said multiplexed beam output from the output facet of said optical multiplexing circuit to extract said check signal,

said check signal reintroducing means comprises a third check terminal section connected to said branching section

and installed at the input facet of said optical multiplexing circuit, and

said check signal detecting means comprises plural pairs of fourth check terminal sections installed at the output facet of said optical multiplexing circuit, and

wherein said multiplexed beam output from the output facet of said optical multiplexing circuit is branched by said branching section to extract said check signal, and

said extracted check signal is reintroduced into said optical multiplexing circuit through said third check terminal section and then is output from said each of plural pairs of fourth check terminal sections as a check signal.

10. The optical multiplexer as claimed in claim 7, wherein said extracting means comprises:

a pair of fifth check terminal sections installed at the output facet of said optical multiplexing circuit; and

a pair of branching sections connected to said pair of fifth check terminal sections to branch a part of said multiplexed light output from each of the fifth check terminal sections to extract said check signals,

said check signal reintroducing means comprises a pair of sixth check terminal sections connected to each of said branching sections and installed at the same facet as that for said fifth check terminal sections, and

said check signal detecting means comprises plural pairs of seventh check terminal sections installed at the input facet of said optical multiplexing circuit,

wherein said multiplexed beam output from each of said fifth check terminal sections at the output of said optical multiplexing circuit is branched by said each branching section and then is extracted as said check signal, and

said each extracted check signal is reintroduced into said optical multiplexing circuit through said sixth check terminal sections and then is output from said each seventh check terminal section as a check signal.

11. An optical multiplexer having an optical multiplexing circuit to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, the multiplexer comprising:

extracting means for extracting a part of the multiplexed beam output from said optical multiplexing circuit to extract a check signal;

check signal reintroducing means for reintroducing said extracted check signal into said optical multiplexing circuit; and

check signal detecting means for detecting said check signal reintroduced into said multiplexing area, at a facet located opposite the facet into which the signal has been reintroduced.

12. The optical multiplexer as claimed in claim 7, wherein either said optical multiplexing circuit and said extracting means, or, said optical multiplexing circuit, said extracting means, and said check signal reintroducing means are integrated together in the same body.

13. The optical multiplexer as claimed in claim 8, wherein either said optical multiplexing circuit and said extracting means, or, said optical multiplexing circuit, said extracting means, and said check signal reintroducing means are integrated together in the same body.

14. The optical multiplexer as claimed in claim 9, wherein either said optical multiplexing circuit and said extracting means, or, said optical multiplexing circuit, said extracting means, and said check signal reintroducing means are integrated together in the same body.

15. The optical multiplexer as claimed in claim10, wherein either said optical multiplexing circuit and said extracting means, or, said optical multiplexing circuit, said extracting means, and said check signal reintroducing means are integrated together in the same body.

16. The optical multiplexer as claimed in claim 11, wherein either said optical multiplexing circuit and said

extracting means, or, said optical multiplexing circuit, said extracting means, and said check signal reintroducing means are integrated together in the same body.

17. An optical multiplexer to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, comprising:

an optimal multiplexing circuit set forth in claim 2;

extracting means for extracting a part of the multiplexed beam output from said optical multiplexing circuit to obtain a check signal;

check signal reintroducing means for reintroducing said extracted check signal into said optical multiplexing circuit; and

check signal detecting means for detecting said check signal reintroduced into said multiplexing area, at a facet located opposite the facet into which the signal has been reintroduced.

18. An optical multiplexer to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, comprising:

an optimal multiplexing circuit set forth in claim 3;

extracting means for extracting a part of the multiplexed beam output from said optical multiplexing circuit to obtain a check signal;

check signal reintroducing means for reintroducing said extracted check signal into said optical multiplexing circuit; and

check signal detecting means for detecting said check signal reintroduced into said multiplexing area, at a facet located opposite the facet into which the signal has been reintroduced.

19. An optical multiplexer to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, comprising:

an optimal multiplexing circuit set forth in claim 4;

extracting means for extracting a part of the multiplexed beam output from said optical multiplexing circuit to obtain a check signal;

check signal reintroducing means for reintroducing said extracted check signal into said optical multiplexing circuit; and

check signal detecting means for detecting said check signal reintroduced into said multiplexing area, at a facet located opposite the facet into which the signal has been reintroduced.

20. An optical multiplexer to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, comprising:

an optimal multiplexing circuit set forth in claim 5;

extracting means for extracting a part of the multiplexed beam output from said optical multiplexing circuit to obtain a check signal;

check signal reintroducing means for reintroducing said extracted check signal into said optical multiplexing circuit; and

check signal detecting means for detecting said check signal reintroduced into said multiplexing area, at a facet located opposite the facet into which the signal has been reintroduced.

21. An optical multiplexer to which a plurality of optical signals are input and which outputs a multiplexed beam subjected to wavelength division multiplexing, comprising:

an optimal multiplexing circuit set forth in claim 6;

extracting means for extracting a part of the multiplexed beam output from said optical multiplexing circuit to obtain a check signal;

check signal reintroducing means for reintroducing said extracted check signal into said optical multiplexing circuit; and

check signal detecting means for detecting said check signal reintroduced into said multiplexing area, at a facet located opposite the facet into which the signal has been reintroduced.